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sympathy. But my long experience with faculties has led to the belief that they are made up, for the most part, of very impractical men. They seem to me to be childlike in their selfishness and their idealism. I believe that this is largely due to the fact that they have been kept in childish bondage, and this simply means that they will have to be entrusted with large administration gradually. I certainly disapprove of the autocracy of the American university president, since I have ceased to be one. No developed institution needs any such dictator. It is not right for any man to hold such a relation to his intellectual peers. The details of your various propositions may be open to discussion, but their general bearing seems to me to be sound.

SCIENTIFIC BOOKS

Outlines of Applied Optics. By P. G. NUTTING, Associate Physicist, Bureau of Standards, Washington, D. C. P. Blakiston's Son & Co. 1912. Pp. 234.

A generation ago text-books on physics, or special sections of physics, came for the most part from those who were connected with the higher educational institutions of the country. They were usually written by men who were teachers besides being physicists, and who instinctively assumed that the reader demanded a consistent presentation of mutual relations rather than of results.

With the development of large and well-equipped laboratories, some of which are wholly independent of educational aims or limitations, a new range of scientific literature is becoming developed, in which specialization of function is not limited to the author, but assumed equally for the reader. The non-technical reader is attracted by a title, and is assured by an introductory glance that the book contains much of value. He is not disappointed, but is perhaps temporarily disturbed by the necessity to shift his customary view-point.

The author of the present volume announces as his keynote the question of securing the best possible results in optical work. He calls attention to the fact that applied optics is

practically untaught in any university. This statement is perhaps a little sweeping, but it is applicable to many of the institutions that in America are called universities. He says frankly in his preface, "the book has been prepared for the worker in applied optics rather than the student; for the men in the field designing instruments, measuring color, examining eyes, identifying illuminants, etc., who may find a suggestion of how to obtain better results or ready information on nearly related subjects."

No one would be apt to open a book on optics who has not already some knowledge of the subject, such knowledge as would cause him to recognize the formulas most commonly in use, besides recognizing the application of principles that are thoroughly established. A well chosen summary of some of these principles occupies much of the introductory chapter, including the formulation of laws connected with names of such investigators as Lambert, Bouguer, Fresnel, Kirchhoff, Stefan, Planck and others. Discarding some obvious typographical errors, and the use of a few words which need explanatory introduction for most readers, the chapter is welcome and interesting.

The second chapter is on the theory of image formation, a subject which bristles with difficulties for the student who aspires to master the various aberrations and the means to be applied for their elimination. The satisfactory presentation of such a subject requires much pedagogical skill, apart from knowledge of the mathematics involved. Pedagogically the author has not always kept in mind some of the principles which every successful teacher must habitually and almost automatically apply, if he wishes to assure himself that his auditors or readers are acquiring power rather than accepting underived formulas on trust. Technical terms are used without adequate definition, and various equations are set forth without deduction. Assuming that the intelligent reader has already studied the subject in detail elsewhere, the chapter constitutes a condensed summary; but to assure himself that he understands everything while reading,

he will need to be somewhat industrious and patient. This may be said with full appreciation of the excellent list of references that is added at the close of every chapter. But the non-technical reader, if he becomes impatient because the demands of the student are not fulfilled, becomes reassured when he looks back into the preface; for he has forgotten that "the book has been prepared for the worker in applied optics rather than the student."

The next chapter is on the design and testing of optical systems. This subject likewise is mathematical, and the treatment is open to some pedagogical criticism; but the amount of information, non-mathematical in form, is increasing; and the individuality of the author as a careful and resourceful investigator is becoming more clearly manifest. Prior to the publication of this book he had become well known through his published work in several branches of optics; and for development in his chosen field it would be hard to find a better place than the Bureau of Standards.

From this point on, the successive chapters contain less material requiring skill in the art of presentation, but much that reveals the author's rich experience in the optical laboratory. He is at home in the discussion of optical instruments and the conditions under which they may be used to best advantage, in the methods of measuring refraction, and in the intricacies of physiological optics. In the treatment of colorimetry, illumination, photometry and spectrophotometry, radiometry and spectroradiometry, polarimetric analysis, plate grain and sensitometry, and interferometry, he has evidently worked with great skill and ardor, enjoying the work thoroughly. He has gleaned information from all possible sources, and has recorded in small compass what might well have been greatly expanded. The present volume is indeed apparently tentative. This is indicated in the preface, where the enterprise is referred to as an entering wedge, since the full treatment of applied optics "could be adequately treated only in a number of volumes by a dozen specialists." It is to be hoped that these volumes will appear in due time, but that upon them better

editorial care may be applied than is manifested in this initial volume.

W. LEC. STEVENS

LEXINGTON, VA., July 10, 1912

Distribution and Origin of Life in America.

By ROBERT FRANCIS SCHARFF. New York, The Macmillan Company. 1912. Pp. xvi + 497, 21 maps.

Students of zoogeography the world over will welcome this book, for the author's masterful treatment of the European fauna¹ leads one to expect that he will bring to it the same wealth of ideas, sound knowledge and good judgment that characterize his previous work. In the opinion of the reviewer this expectation is fulfilled. The data are presented about as exhaustively as is possible in a work of this size, the opinions of different students are summarized in an unbiased way, the generalizations and data are carefully weighed, and the author's conclusions are clearly expressed.

Very little but good can be said of the general method of attack. Dr. Scharff fully realizes that problems of origin and dispersal can not be approached from the standpoint of zoogeographical regions, and no space is given to this subject. He analyzes separately the faunas of different parts of North, Central and South America, and of the Antilles, Bermudas, Galapagos and other American islands, and endeavors to discover the sources and migration routes of the different elements. He goes to some length to show the very small rôle which he believes accidental dispersal plays in the populating of distant lands—a method that has been clearly overestimated since the classic works of Darwin and Wallace—and expresses the conviction that the facts of North American zoogeography can best be interpreted by postulating various land bridges. When such land bridges are apparently called for, the author endeavors to gather evidence for them from botany, geology and paleontology.

Dr. Scharff argues for the existence in pre-Glacial or Glacial times of a North Atlantic land bridge, connecting Scotland, Iceland, Greenland, and Labrador, and a North Pacific

¹ "The History of the European Fauna."